



Exam style question – The Big Bang

In 1915 Einstein used his theory of General Relativity to try to understand what the cosmos was like. His calculations led to the conclusion that the universe could not be stable; it should be either expanding or collapsing. As Einstein believed the universe was stable, he modified his equations to produce that result. He thought he was improving his theory, to make it match better to reality – but he later described this as 'the biggest blunder of my life'.

In 1929, the American astronomer Edwin Hubble made measurements that allowed him to estimate the speed at which galaxies were moving away from the Earth. His calculations indicated that the further away a galaxy was, the faster it was moving away from us. This implied that the universe was expanding. Hubble and other astronomers proposed that the universe had originated in a 'Big Bang'.

Some other astronomers were not convinced. Their research led them to think that matter was distributed uniformly throughout the universe – and did not get more spread out with time. They proposed an alternative theory, the Steady State theory, which proposed that matter was constantly being produced to keep the average density of the universe constant as it expanded.

By the 1950s there were still two competing theories on the origin of the universe: the Big Bang theory and the Steady State theory. One of the predictions of the Big Bang theory was that radiation produced in the Big Bang should still be detectable. This radiation was found in 1964 by Penzias and Wilson. This is one of the reasons why most astronomers now accept the Big Bang theory.

(a) Explain briefly what is meant by the Big Bang theory.

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(3 marks)

(b) From the account above briefly identify an example of each of the following

(i) An observation

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(1 mark)

(ii) A correlation between two variables

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(1 mark)

(iii) An explanation that involved conjecture and creative imagination.

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(1 mark)

(iv) A second explanation that also involved conjecture and creative imagination

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(1 mark)

(v) A testable prediction from a theory

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(1 mark)

(vi) The use of observation to increase confidence in an explanation or theory

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(1 mark)

(vii) The way a person's views can influence their interpretations.

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(1 mark)

Total marks 10